Pbar Source Status

Dave McGinnis

7/18/02

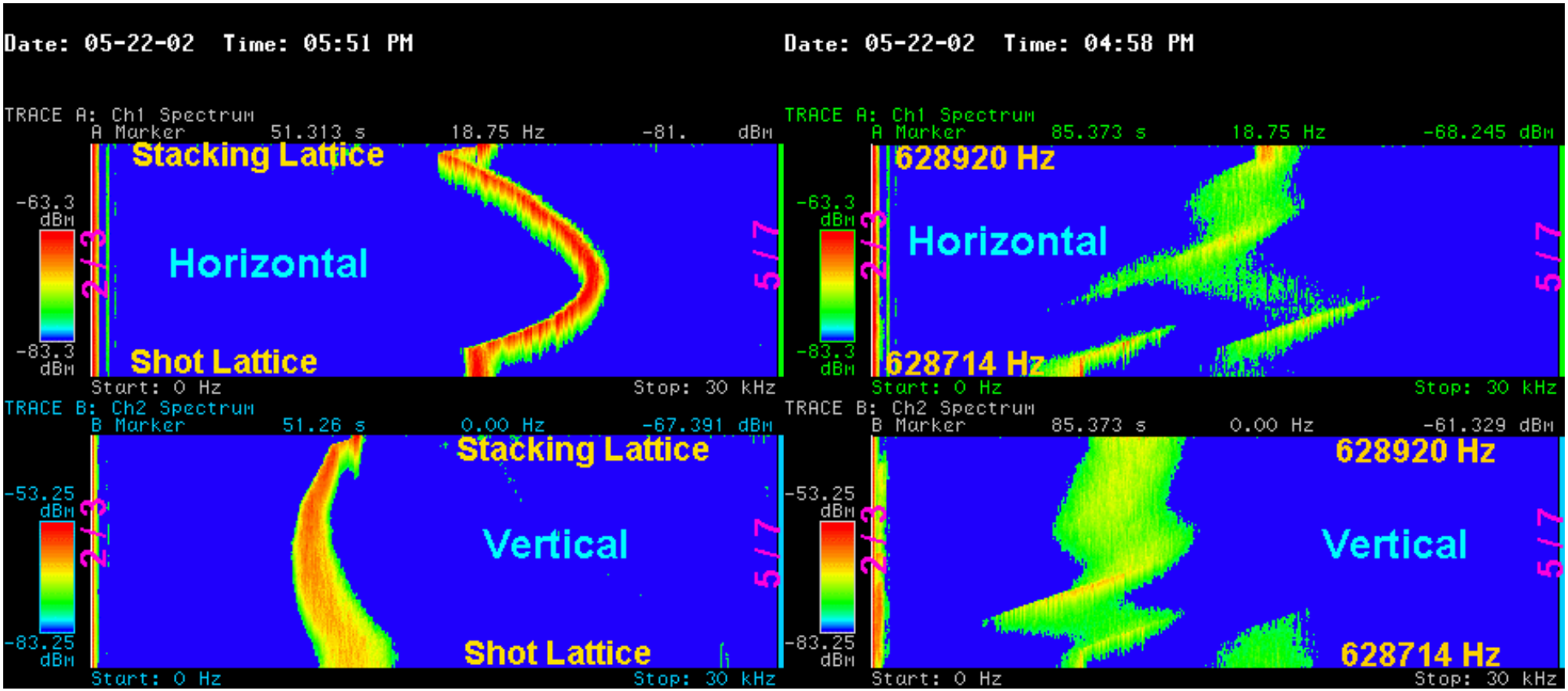
Run II Commissioning Meeting

Pbar Studies Since May 1, 2002

- New Core 2-4 GHz Momentum Kicker
  - Core Cooling Upgrade removed the 2-4 GHz kicker that was used for both transverse and momentum cooling.
  - We dedicated one of the stacktail kickers to be the new core 2-4 momentum kicker
    - This new kicker (one array) has half as many electrodes as the old kicker (2 arrays)
    - We need to run twice as much power from the 2-4 core momentum TWT
      - I think this might hurt at large stacks

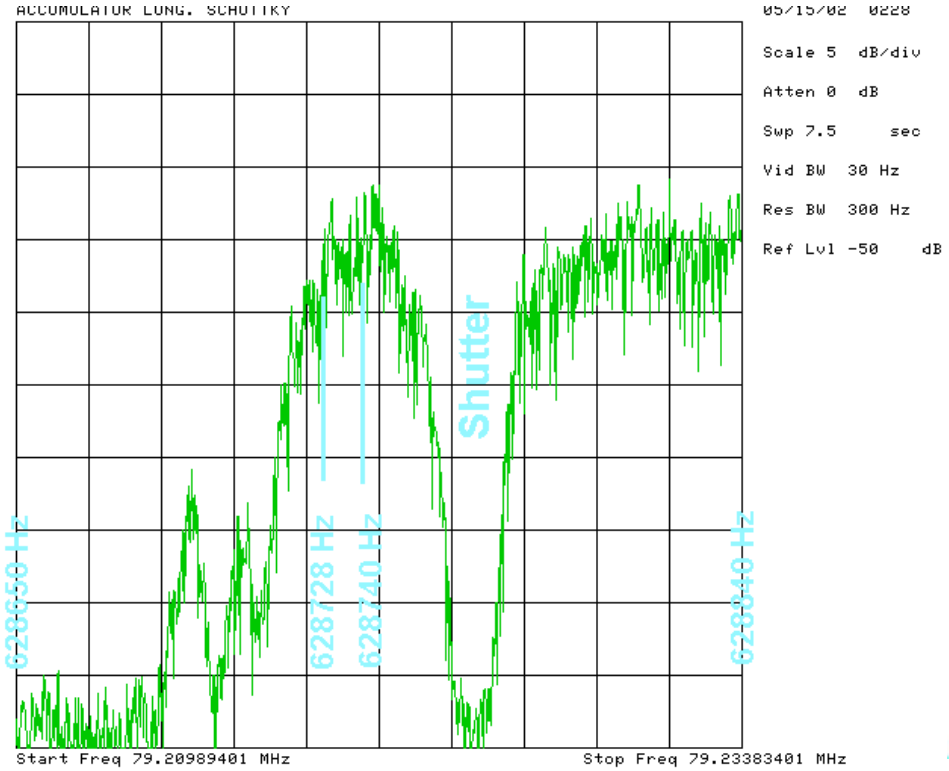
Pbar Studies Since May 1, 2002

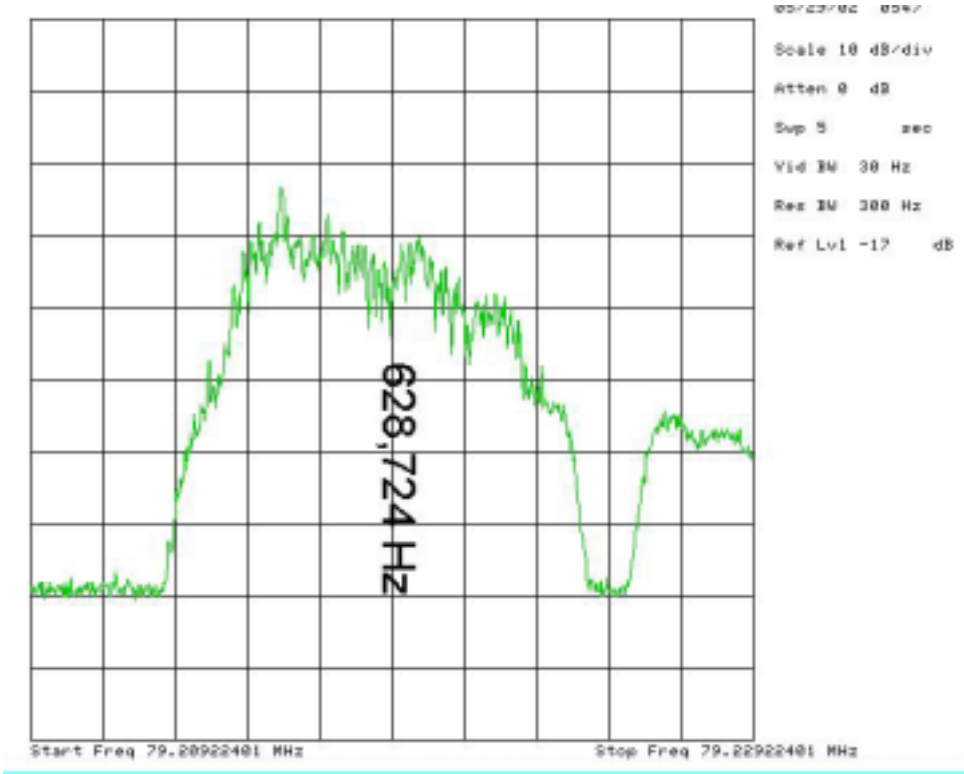
- Shot Lattice Development
  - Orbit, Tunes, Chromaticity, Coupling measurements



Pbar Studies Since May 1, 2002

- Shot Lattice Development
  - Beam-line Matching
  - Bend Bus Ramp





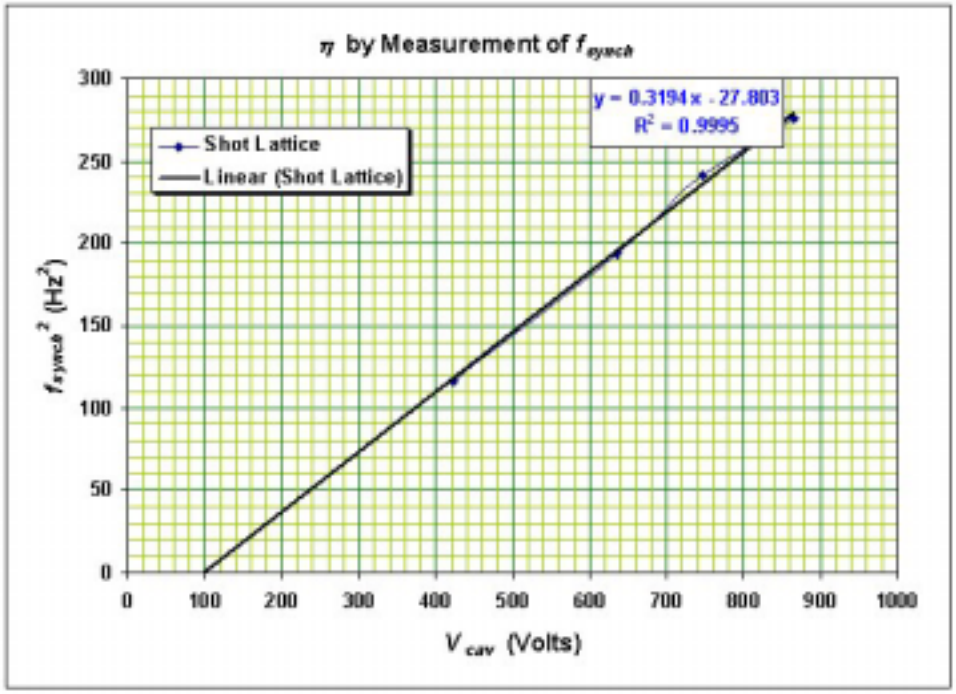
Without Bend Bus Ramp

With Bend Bus Ramp

Pbar Studies Since May 1, 2002

- Shot Lattice Development
  - η measurements

5/22/02	Pbar Electronic logbook 2002 - Day Shift						
Shot Lattice Core orbit							
					Unconstrained	Go thru (0,0)	
P_{beam} =	8707.50	**MeV/c**		**slope** =	0.36469	0.31342	
L_{orbit} =	473.930679	**m**		**η** =	**0.02508**	**0.02155**	
f_{rev} =	628922.5	**Hz**		γ_t =	**5.2304**	**5.5024**	
			AP10 FB				
A:R3LLAM	**A:R3HLFB**	**FB Pk-Pk**	**Cavity Ampl.**	f_{synch}	**expected**	f_{synch}^2	
	(Volts)	**(mV)**	**(Volts)**	**(Hz)**	**(Hz)**	**(Hz^2)**	
7.642	436.20	33.80	422.50	10.8094	7.6972	116.842	
7.997	640.40	50.80	635.00	13.9313	9.4364	194.080	
8.170	771.00	59.60	745.00	15.5438	10.2211	241.608	
8.342	928.20	69.20	865.00	16.5938	11.0135	275.353	

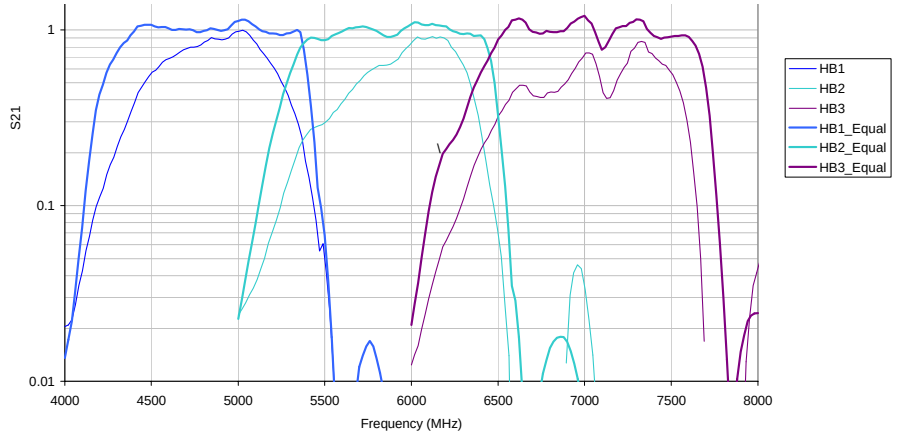


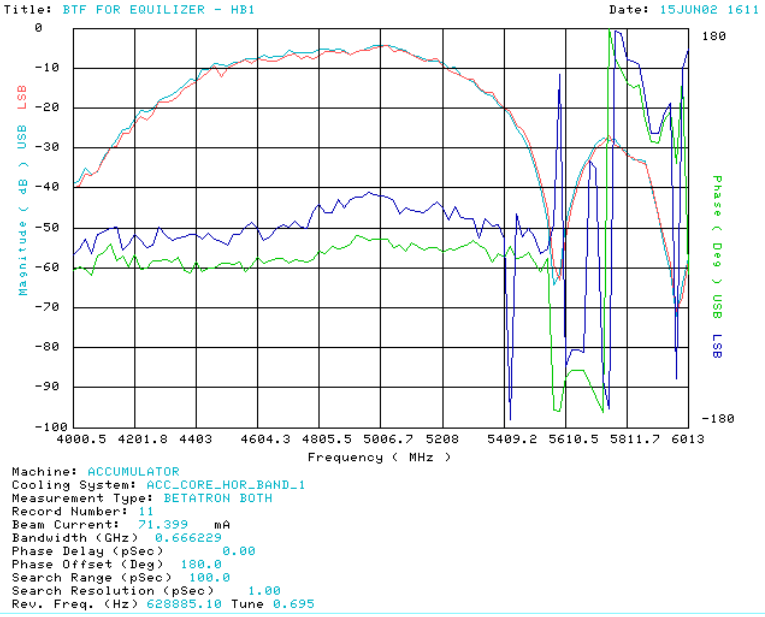
Pbar Studies Since May 1, 2002

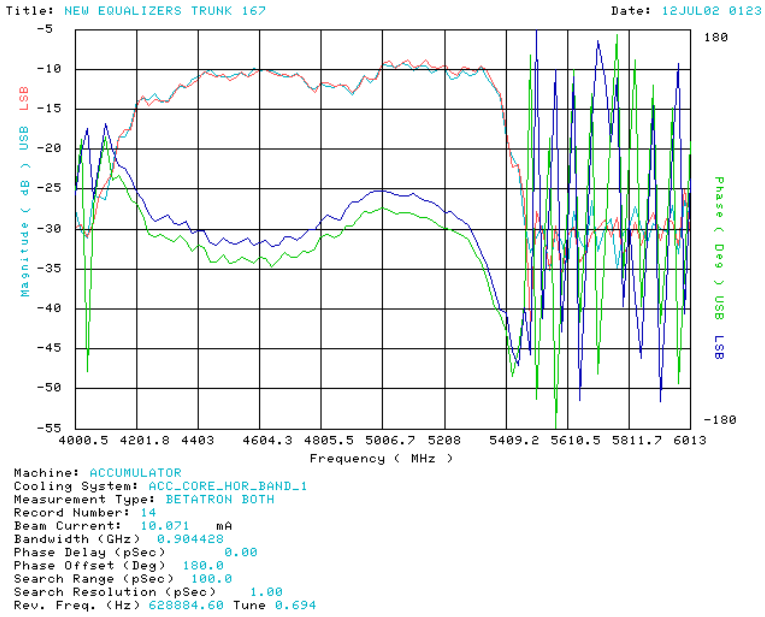
- Accumulator Transverse Core Cooling Commissioning
  - The project was started on 10/30/01 and tank construction was completed 5/17/02 (5.5 months)
  - Old system decommissioning and new tank installation started on 6/3/02 and was completed 6/12/02 (2 days ahead of schedule)
  - System phasing started on the afternoon of 6/14/02 and was completed on the evening of 6/15/02.
  - The new system has a bandwidth of 2.5 GHz compared to a bandwidth of 1.1 GHz for the old 2-4 system and 1.5GHz for the old 4-8 system
  - Because of the higher frequency bands, the effective cooling rate of the new system is 1.5x faster than the combined rate of the old systems
  - With an 82 mA stack, we have a peak signal to noise ratio of 8 dB at 7.5 GHz for a 7 pi normalized emittance.
    - I think this makes these the world's highest frequency accelerating RF structures involved in producing HEP
  - We are presently working on equalizing filters.
    - Equalizing filters are used in all of the cooling systems and can only be designed after the first beam transfer function measurements are done.
    - These equalizers will extend the bandwidth of the new cooling systems to 3.7 GHz.
    - This will make the cooling rate of the new systems 2.5x faster than the combined rate of the old systems

Pbar Studies Since May 1, 2002

- Accumulator Transverse Core Cooling Commissioning
  - Equalizers

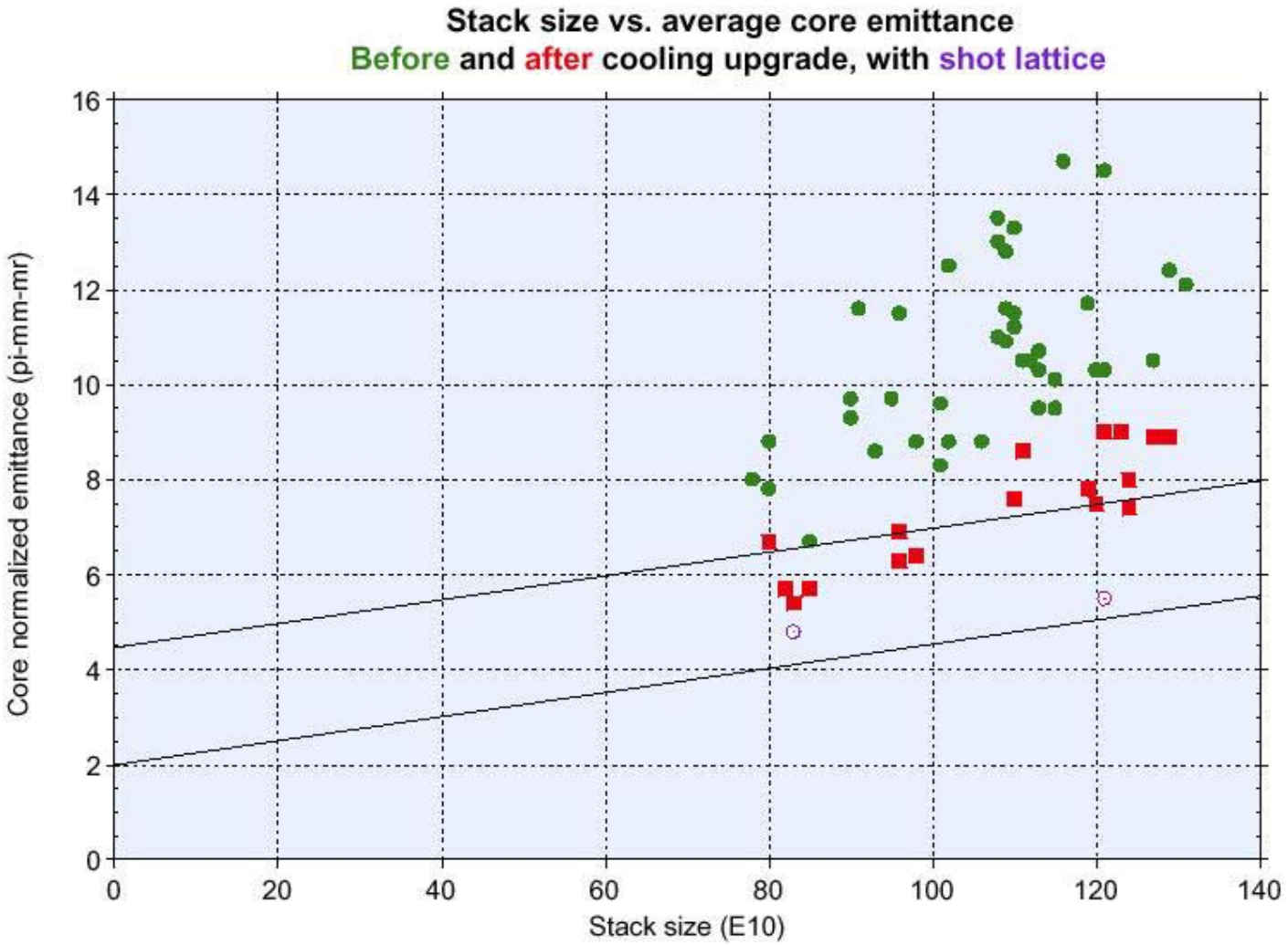






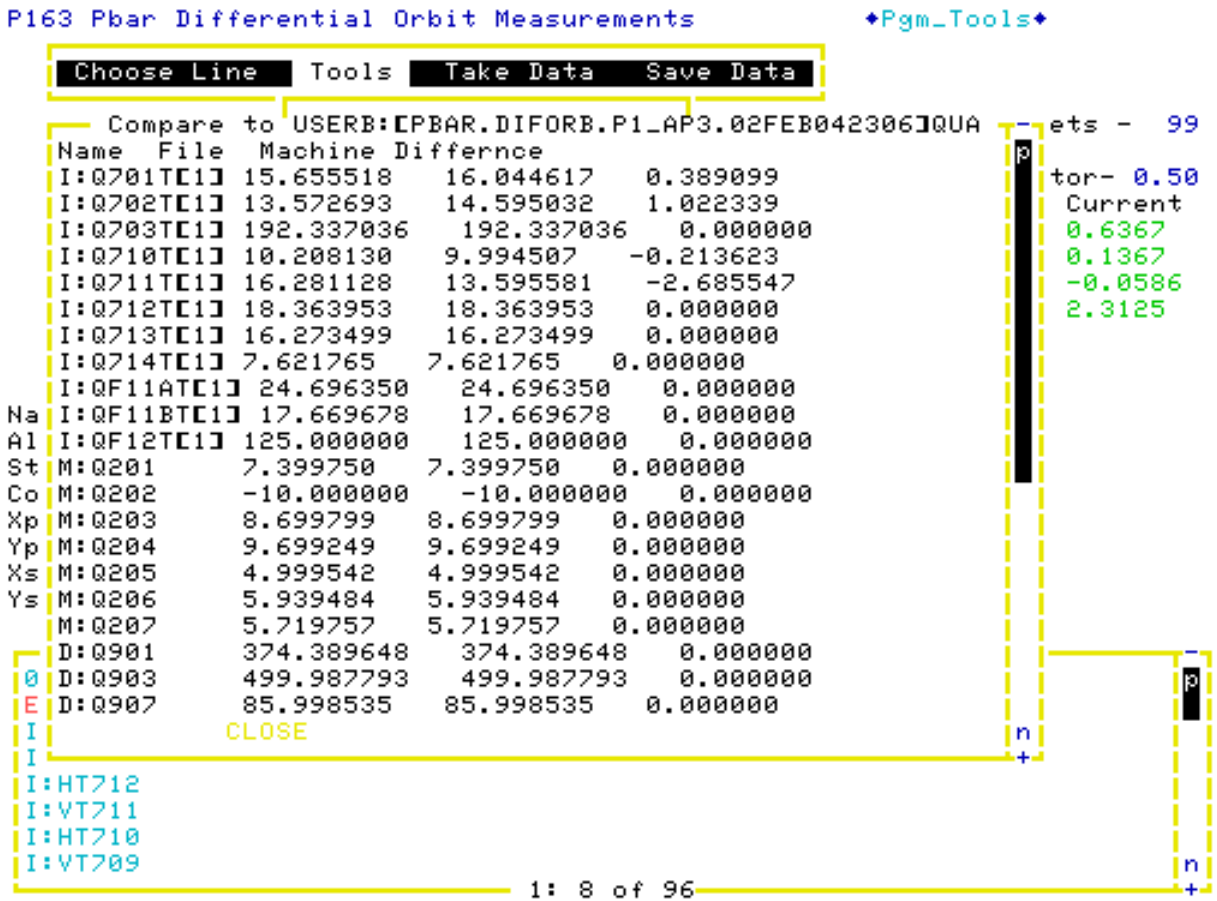
Pbar Studies Since May 1, 2002

- Accumulator Transverse Core Cooling Commissioning



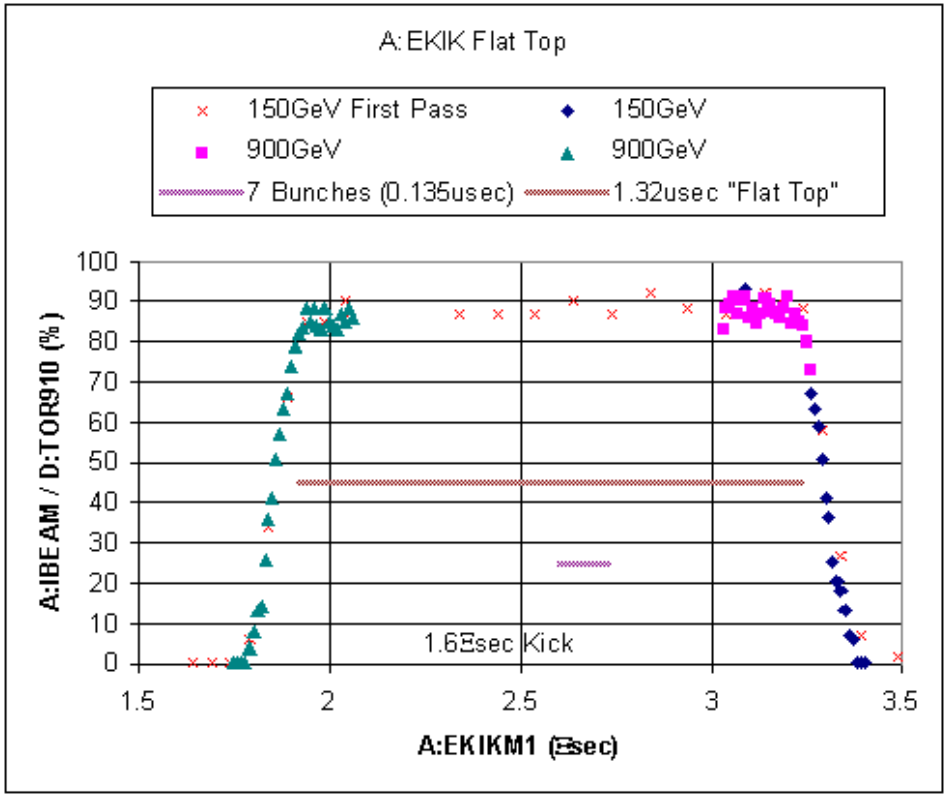
Pbar Studies Since May 1, 2002

- P1-AP3 Beamline lattice measurements
  - Beam Line Transfer function is drifting!

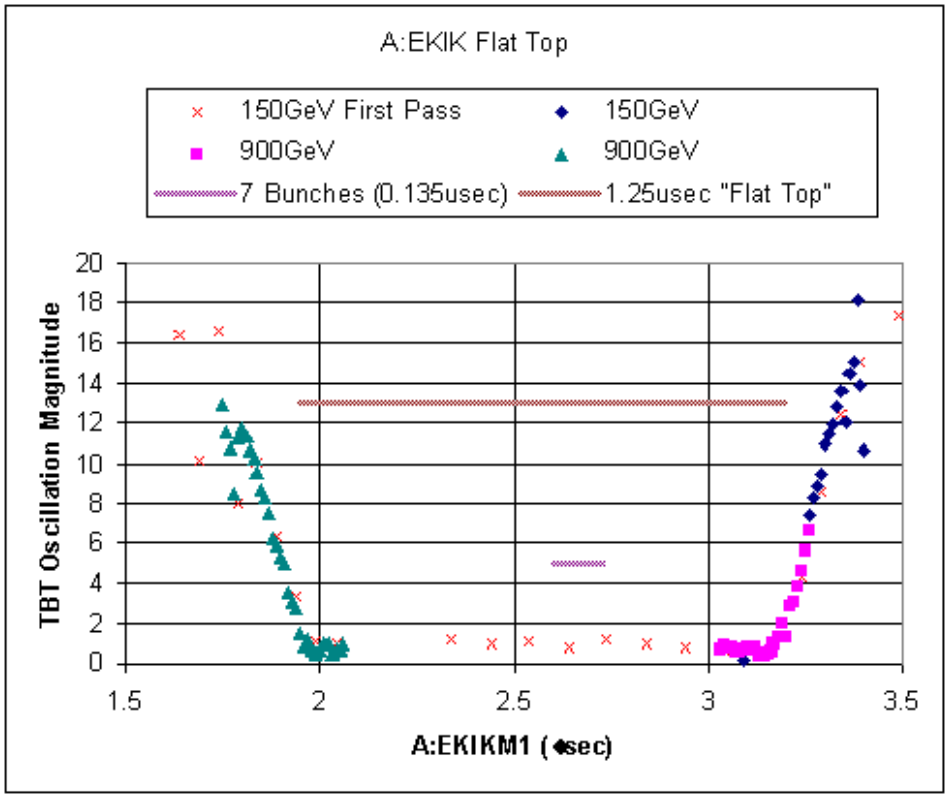


Pbar Studies Since May 1, 2002

- EKIK Measurements



Transfer Efficiency



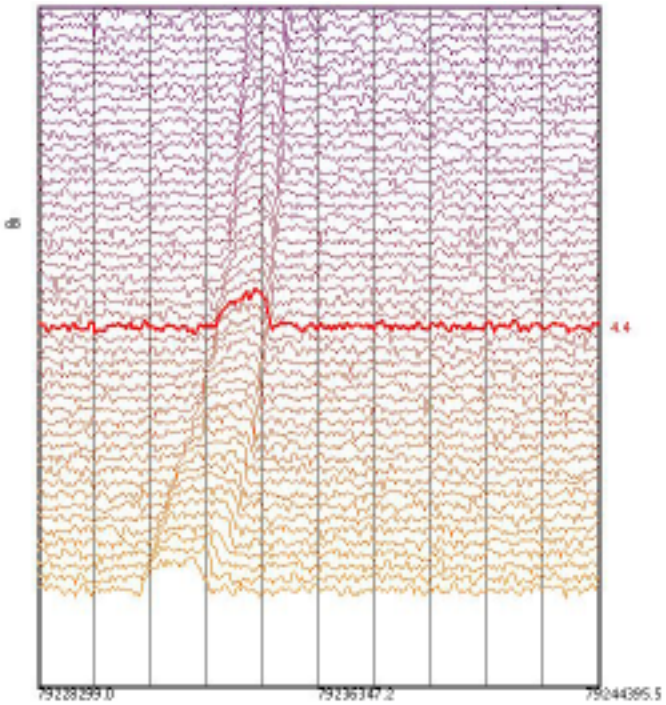
TBT Oscillations

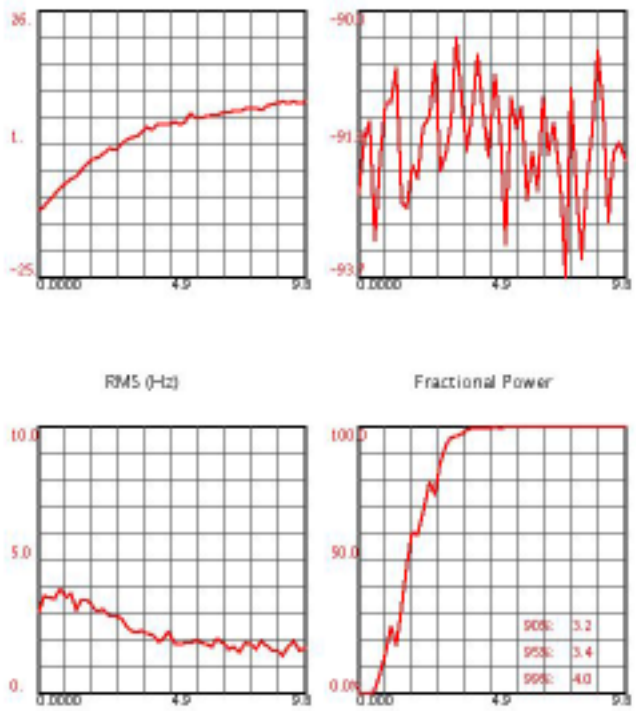
Pbar Studies Since May 1, 2002

- Flying Wires
  - Goal: Calibrate Schottky monitors each shot
  - Status: Can measure Horz. profile in low dispersion and Horz. and Vert. profiles in high dispersion for core and injection orbits
  - Problems
    - Large angle and Position offsets need large gates
    - Measurements are unstable
      - Problems is not with software and could be caused by sagging wires
      - Need to open up A40 during Fall shutdown
- Quadrupole Pickup measurements
  - Goal: Use as a tool for beamline matching
  - Status: Have made numerous measurements and have developed on offline algorithm to determine quadrupole oscillations
  - Problems:
    - Pre-amps saturate during first few turns
    - Additional lines on spectrum we don't understand
  - Future:
    - New pre-amps
    - Online algorithm
    - More studies

Pbar Studies Since May 1, 2002

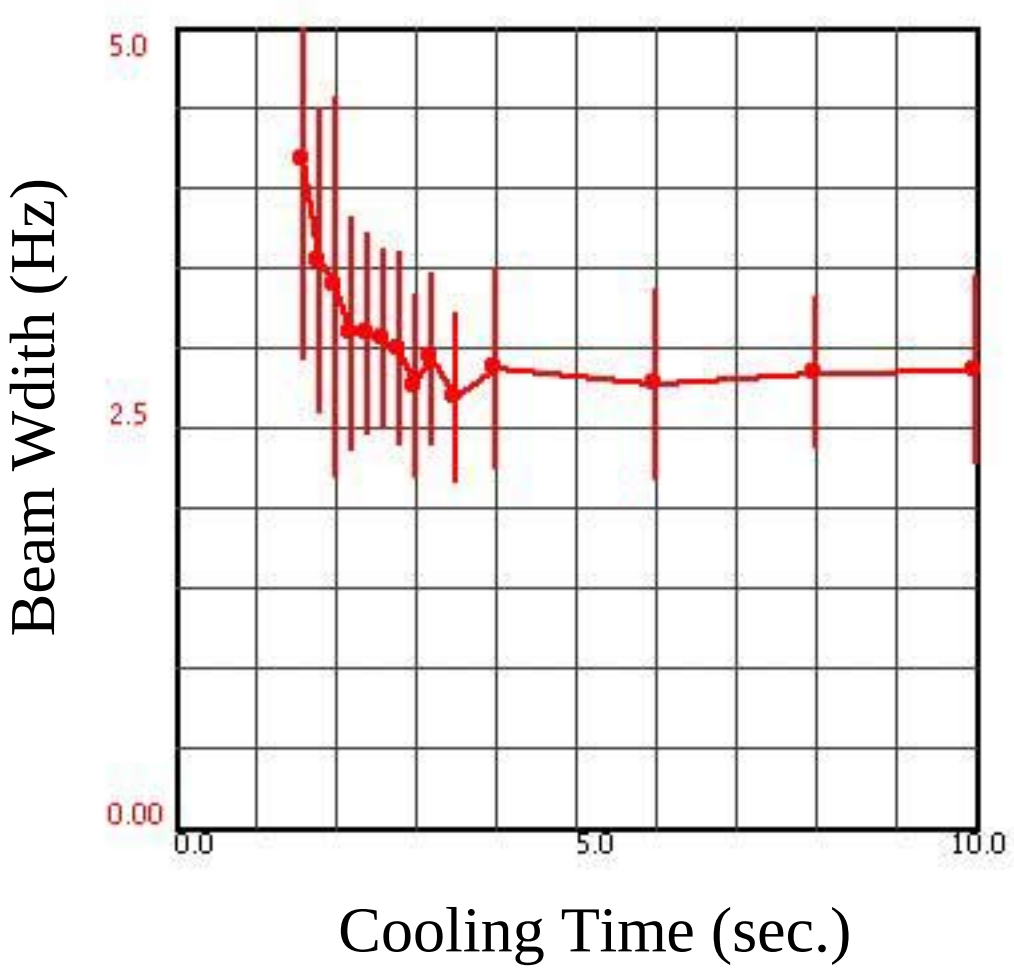
- Stacktail Pulse Evolution
  - Goal:
    - Faster rep rate.
    - Run IIb





Pbar Studies Since May 1, 2002

- Debuncher Momentum Cooling Measurements



Pbar Short Term Future Plans

- Finish core cooling equalizers – July 30, 2002
- Make Shot Lattice operational - July 30, 2002
- Stacking Studies
  - Increase the Rep. Rate!
    - Decrease Bunch Length on target from 2 ns to 0.5 ns
    - Understand Debuncher Momentum Cooling Limitations
      - Install new band filters
      - Notch Filter alignment and dispersion
      - System dynamic range
    - ARF1 Curve optimization
      - New curve generation software
      - New low-level hardware?
    - Stacktail System
      - Commission compensation legs installed last January
      - Extend the bandwidth below 2 GHz (new BAW filters)
      - Delta Kickers (oops! We don't have 2-4 GHz transverse pickups anymore)

Pbar Future Plans

- Pbar Stacking Studies
  - Increase the Production efficiency
    - Debuncher Momentum Aperture
      - New synchronization scheme for Debuncher phase lock?
    - AP2 & Debuncher Transverse aperture
      - Install moveable quad stands and trims during Fall shutdown
      - Install new Debuncher BPM closed orbit system
      - Reverse protons studies up AP2
    - Understand Debuncher Transverse Cooling limitations
- How will we handle large pbar stacks? (>150 mA)